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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/050,334 | 01/15/2002 | Vishnu K. Agarwal | MI22-1913 | 7861 |

21567 7590 07/30/2002

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EXAMINER

HUYNH, YENNHU B

| ART UNIT | PAPER NUMBER |
|----------|--------------|
|----------|--------------|

2813

DATE MAILED: 07/30/2002

4

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|-------------------------------|--------------------------------|--|
| Office Action Summary | Application No. 10/050,334 | Applicant(s) AGARWAL ET AL. | |
| | Examiner Yennhu B. Huynh | Art Unit 2813 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 January 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) 1-15 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 16-20 and 22-26 is/are rejected.
- 7) ☒ Claim(s) 21 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

Claims 1-15 have been cancelled by Amendment filed on 1/15/02.

Specification

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: Capacitor Constructions With Outer Surface Area Of First Electrode Greater Than Outer Surface Area.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 16-20, & 22-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kitamura in view of Fukuzumi et al. (U.S. 2001/0023110A1).

Kitamura in related art disclose a semiconductor device, which include:

Re. claim 16: an opening 101 in an insulating layer 48 over a substrate 41 the opening having sides and bottom; a first capacitor electrode 2A over the substrate 41, the electrode having an inner surface area 2C per unit area and outer surface area 2A

per unit area (fig. 2E, p. 4, [0052], that are both greater than an outer surface area per unit area of the substrate (p. 2, [0026]). (Kitamura does not disclose clearly ~~the~~ *the* inner surface area per unit area and outer surface area per unit area that are greater than an outer surface area, but indicate that the grains grown on the inner surface area and ~~are~~ *not* grown to outer of the surface area by some outer layer serves as a stopper layer to the grains (p. 2, [0026]); therefore the area of both inner area 2C and outer area 2A are greater than the outer area of the substrate); forming a capacitor dielectric layer 11A over the first electrode, and a second capacitor electrode 3A over the dielectric layer.

Re. claims 17 & 25: wherein a bottom electrode comprises TiN layer (col.3, [0046]).

Re. claims 18 -20, 23 & 24: comprising rugged undoped polysilicon over the substrate (col. 4, [0051]) and comprises spaced apart grains (fig. 2B-2E).

Re. claim 26: wherein the dielectric layer comprises Ta2O5 (col.4, [0057]).

However, Kitamura does not disclose the HSG layer over the sides of the opening but not over the bottom (cl.22), and wherein the capacitor dielectric layer comprises of ZrO2, WO3, Al2O3, HfO2, BST or ST material (cl.26).

Fukuzumi et al. in related art disclose:

-Re. claims 21 & 22: an opening 5 in an insulating layer 4 over a substrate 2, the opening having sides and a bottom; a HSG layer over the sides of the opening but not over the bottom; a first capacitor electrode layer 7 on the polysilicon, which has a ?

-Re. claim 26: wherein the dielectric layer comprises of Ta₂O₅, ZrO₂, BST or ST (col.5, [0080, 0084, 0151]).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine the teaching from Fukuzumi et al. 's process in forming the HSG over the sides of opening to increase the electrode area and obtain a large capacitance in a small cell area capacitor structure. In addition, the using of Ta₂O₅, ZrO₂, BST or ST high dielectric material to prevent leakage current when structure processed at a high temperature, into Kitamura 's process. This modification would complete the capacitor constructions as claimed invention.

With respect to claim 21 wherein the thickness of the outer surface area of the first electrode is at least 30% greater than the substrate outer surface area is considered to involve routine optimization while has been held to be within the level of ordinary skill in the art, As noted In re Aller, the selection of reaction parameters such as temperature and concentration would have been obvious.

"Normally, it is to expected that a change in temperature, or in range, concentration, cycles, thickness, would be an unpatentable modification. Under some circumstance, however, changes such as these may be impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art ... such ranges are termed "critical ranges and the applicant has the burden of proving such criticality ... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation."

In re Aller 105 USPQ233, 255 (CCPA 1955). See also In re Waite 77 USPQ 586 (CCPA 1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmischer 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934)

Conclusion


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yennhu B. Huynh whose telephone number is 703-308-6110. The examiner can normally be reached on M-F 8.30AM-7.00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri, can be reached 703-306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

YNBH,

7/19/02


OLIK CHAUDHURI
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TECHNOLOGY CENTER 2800